

Amendments to the Claims

8. (Currently Amended) ~~A data packet traffic managing method of providing adaptive bandwidth management and scheduling to a variable length data packet switch/router system in a converged network environment that receives different data packet traffic flows having different specific customer assigned service requirements including definition of service, priority, delay, jitter and bandwidth characteristics, and for routing the data packet flow to a common communication link for simultaneous transmission flow along the common link, the method comprising, In a switch/router that routes variable length data packets in a converged network environment, a method comprising:~~

receiving a plurality of data packet flows, each received data packet flow of the plurality having respective customer-assigned service requirements, including definition of service, priority, delay, jitter and bandwidth characteristics;

directing the received data packet flows to corresponding egress queues;

allocating ~~different~~ amounts or percentages of bandwidth to each data packet traffic flow of the plurality of data packet flows in accordance with the respective customer-assigned service requirements[[:]]-and by:

selecting amounts of bandwidth assigned to each of the egress queues and determining an amount of data to be released from each egress queue;

monitoring an occupancy of each egress queue to determine an amount of unused bandwidth that is allocated to but not used in any given egress queue;

managing the unused bandwidth in a repository for unused bandwidth, so as to be available for allocation to other egress queues that can utilize the unused bandwidth; and

making at least a portion of the unused bandwidth available from the repository

for use by another egress queue that has more data to send than the allocated bandwidth will permit; and

scheduling ~~the~~ a departure order of the different each of the plurality of data packet traffic flows from the switch/router to the a common communication link based upon and adapted to said the respective customer-assigned service requirements, and with preservation of the ~~respective various traffic characteristics and priorities by selecting, independently of bandwidth allocation, at least one of an order and a priority of data packet release from the egress queues to~~ the common communication link,

whereby the switch/router provides differentiated services for the plurality of the various data packet traffic flows, while simultaneously substantially filling ~~the~~ a total data packet flow capacity utilization of the common communication link; ~~and~~

~~wherein the different data packet traffic is routed to corresponding egress queues, the bandwidth allocating selects the amounts of bandwidth assigned to each of the queues determining how much data should be released from each queue, and the scheduling, independently of the bandwidth allocating, selects the order or priority of data packet release from the queues to the common communication link, wherein the presence of data in each queue is sensed and indicated to the traffic managing for enabling awareness as to the presence of data in the queue, and wherein, in accordance with such sensing and awareness, unused or “free” bandwidth allocated to but not used in a queue, is made available for use by another queue that has more data to send than allocated bandwidth will permit; and wherein the unused bandwidth of the queues is managed in a “free” “bucket” to be available for allocation to other queues that can utilize the seam, thereby to insure the full capacity utilization of the link and without wasting bandwidth.~~

9. (Currently amended) The method of claim 8 wherein ~~the making available of~~ “free” ~~bandwidth from one queue to another queue that can utilize the same, is effected~~ making at least a portion of the unused bandwidth available from the repository for use by another egress queue comprises making the unused bandwidth available for use without crediting or debiting any egress queue.

10. (Currently amended) The method of claim 9 wherein each egress queue is provided with a base weight system and counter to enable users to control ~~the a~~ a percentage of “free” unused bandwidth distributed ~~in the different among the egress queues, with the~~ “free” and wherein making at least a portion of the unused bandwidth available from the repository for use by another egress queue comprises bandwidth managing making assignment to a assigning unused bandwidth to another egress queue based upon such weights of the weight system, the an amount of data present in queue memory, and on the “free” unused bandwidth available.

21. (Currently amended) ~~In a system for variable length data packet traffic flow, a configurable adaptive bandwidth management and scheduling apparatus for a data packet switch/router system in a converged network environment for receiving different data packet traffic flows, said apparatus having, in combination, A switch/router that routes variable length data packets in a converged network environment, the switch/router comprising, in combination:~~
means for receiving a plurality of data packet flows, each received data packet flow of the plurality having respective customer-assigned service requirements, including definition of service, priority, delay, jitter and bandwidth characteristics;

means for directing the received data packet flows to corresponding egress queues;

means for allocating amounts of bandwidth to each data packet traffic flow of the plurality of data packet flows in accordance with the respective customer-assigned service requirements through:

means for selecting amounts of bandwidth assigned to each of the egress queues and determining an amount of data to be released from each egress queue;

means for monitoring an occupancy of each egress queue to determine an amount of unused bandwidth that is allocated to but not used in any given egress queue;

means for managing the unused bandwidth in a repository for unused bandwidth, so as to be available for allocation to other egress queues that can utilize the unused bandwidth; and

means for making at least a portion of the unused bandwidth available from the repository for use by another egress queue that has more data to send than the allocated bandwidth will permit; and

means for scheduling a departure order of the each of the plurality of data packet traffic flows from the switch/router to a common communication link based upon and adapted to the respective customer-assigned service requirements, by selecting, independently of bandwidth allocation, at least one of an order and a priority of data packet release from the egress queues to the common communication link,

whereby the switch/router provides differentiated services for the plurality of data packet traffic flows, while simultaneously substantially filling a total data packet flow capacity utilization of the common communication link.

~~means for receiving the different data packets with respective different specific customer-~~
~~assigned service requirements including definition of service, priority, delay, jitter and~~
~~bandwidth characteristics, to be routed to a common communication link for simultaneous~~
~~transmission flow therealong; bandwidth allocation means for allocating different amounts or~~
~~percentages of bandwidth to each data packet traffic flow in accordance with respective~~
~~customer assigned service requirements; means for scheduling the departure order of the~~
~~different traffic flows from the router to the communication link based upon and adapted to said~~
~~respective service requirements; and means for preserving the respective various traffic~~
~~characteristics and priorities for each different data packet traffic flow, whereby the switch/router~~
~~provides differentiated services for the various data traffic flows, while simultaneously~~
~~substantially filling the total data packet flow capacity utilization of the link; and wherein the~~
~~different data packet traffic is routed to corresponding egress queues and, the bandwidth~~
~~allocating means selects the amounts of bandwidth assigned to each of the queues, determining~~
~~how much data should be released from each queue, and the scheduling means independently of~~
~~the bandwidth allocating, selects the order or priority of data packet release from the queues to~~
~~the common communication link; and wherein means is provided for sensing the presence of~~
~~data in each queue and indicating the same for enabling awareness as to the presence of data in~~
~~the queue; and wherein means is provided, operable in accordance with such sensing and~~
~~awareness for making unused or “free” bandwidth allocated to but not used in a queue, available~~
~~for use by another queue that has more data to send than its allocated bandwidth will permit; and~~
~~wherein means is provided for accommodating the unused bandwidth of the queues in a “free”~~
~~bucket” to be available for allocation to other queues that can utilize the same, thereby to insure~~
~~the full capacity utilization of the link and without wasting bandwidth.~~

22. (Currently amended) The switch/router apparatus of claim 21 wherein ~~the making available of “free” bandwidth from one queue to another queue that can utilize the same, is effected~~ means for making at least a portion of the unused bandwidth available from the repository for use by another egress queue ~~comprise means for making the unused bandwidth available for use~~ without crediting or debiting any egress queue.

23. (Currently amended) The switch/router apparatus of claim 22 wherein each egress queue is provided with a base weight system and counter to enable users to control ~~the a~~ a percentage of “free” unused bandwidth distributed ~~in the different~~ among the egress queues, ~~with the “free”~~ and wherein means for making at least a portion of the unused bandwidth available from the repository for use by another egress queue ~~comprise means for bandwidth allocation~~ ~~means making assignment to a~~ assigning unused bandwidth to another egress queue based upon ~~such weights of the weight system, the an~~ an amount of data present in queue memory, and on the “free” unused bandwidth available.

24. (New) The method of claim 8, wherein allocating amounts of bandwidth comprises allocating percentages of bandwidth.

25. (New) The method of claim 21, wherein means for allocating amounts of bandwidth ~~comprise means for allocating percentages of bandwidth.~~